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The Task Force On Urbanization And The Future

solid wastes: problems and solutions

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You can accomplish almost anything, if you don't mind who gets the credit
February, 1972

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I. INTRODUCTION

There have been many positive advantages stemming from the growth of our urban areas. There have also been accompanying problems. One of these, which is assuming ever greater importance from both an economic and environmental point of view, is the problem of solid waste.

On the recommendation of civic officials, the Task Force on Urbanization has established a Task Committee on Solid Waste Disposal in the Edmonton-Wetaskiwin-Camrose region. This Task Committee is examining methods now being used, alternatives to present methods and the legislation affecting solid waste.

In this pamphlet, the various possibilities for the disposal of solid waste will be considered; these being sanitary landfill, incineration, composting and fragmentization. Each has its merits but each also has its disadvantages.

Secondly, we will consider the reutilization or recycling of wastes. As natural resources become more limited, recycling of materials will become more necessary. For the moment, however, it is questionable if the throwaway cult is in serious decline. Difficult as it would be to do a cost-benefit analysis of present disposal methods, it would be even more difficult to do one of recycling because of the magnitude of the system change implied. Consequently, recycling is often passed off as an unlikely alternative for getting rid of solid waste. Added to this problem of analysis is the total political social problem. Thus, again, recycling would require a total reorientation of our present system, and would at least in the short run, probably create many inconveniences.

Immediate possibilities are for individually extended operations in recycling certain kinds of solid waste. The long range considerations are those involving "total" recycling schemes which ultimately might be the answer to depleting resources and growing amounts of waste.

Present disposal methods are significant because in the interim period before recycling can be utilized at all, something must still be done to handle solid waste. It would also be useful if recycling, which is an ultimate solution to the solid waste disposal problem, were considered now in order that it could be gently phased into the overall program dealing with solid waste and so as to incorporate it without severely jolting various groups; including the citizens, manufacturers, etc., who will bear the initial costs of this approach. This paper then, will be concerned with these two aspects of solid waste: (a) immediate disposal, and (b) reutilization and recycling. It must be noted that disposal of wastes will be the easier aspect to explain in terms of familiar terminology, such as: cost-benefit analysis, jurisdictional problems and individual rights on the disposal subject. Recycling, on the other hand, a relatively recent concept, cannot so easily be explained within these same terms of reference. Whereas recycling focuses on the reutilization or the alternate use of a product after its initial use is finished, disposal involves getting rid of garbage by burying, incineration, disintegration, etc., which in turn cause other problems, including non-returnable costs, pollution, resource wastage, etc.

II. SOLID WASTE DISPOSAL

The present methods of disposal of society's waste are increasingly inadequate owing to the increasing population on one hand, and the natural aversion to spending money on the removal of wastes on the other hand. "At the present time Canadian households generate some 25,000 tons of solid waste every day and an equal amount of wet sewage sludge. Industrial and commercial establishments produce at least five times, and as much as ten times the amount of solid waste generated by households."[1] It is becoming evident that wastes produced in our society are creating a problem for the environment such that some action must be taken. Indeed much is being done within the province to try and ensure a continuing livable environment.

However, many municipalities are finding it increasingly difficult to effectively dispose of their wastes due to such things as legislation, costs, etc. The City of Edmonton, for instance, spent over .3 million dollars for the disposal of refuse in 1968 and the City of Calgary just over .5 million dollars (this does not include the cost of collection of the refuse). With Albertans generating approximately one ton of garbage per person per year, the problem as to how to dispose of it is constantly increasing.

(a) What are the alternatives?

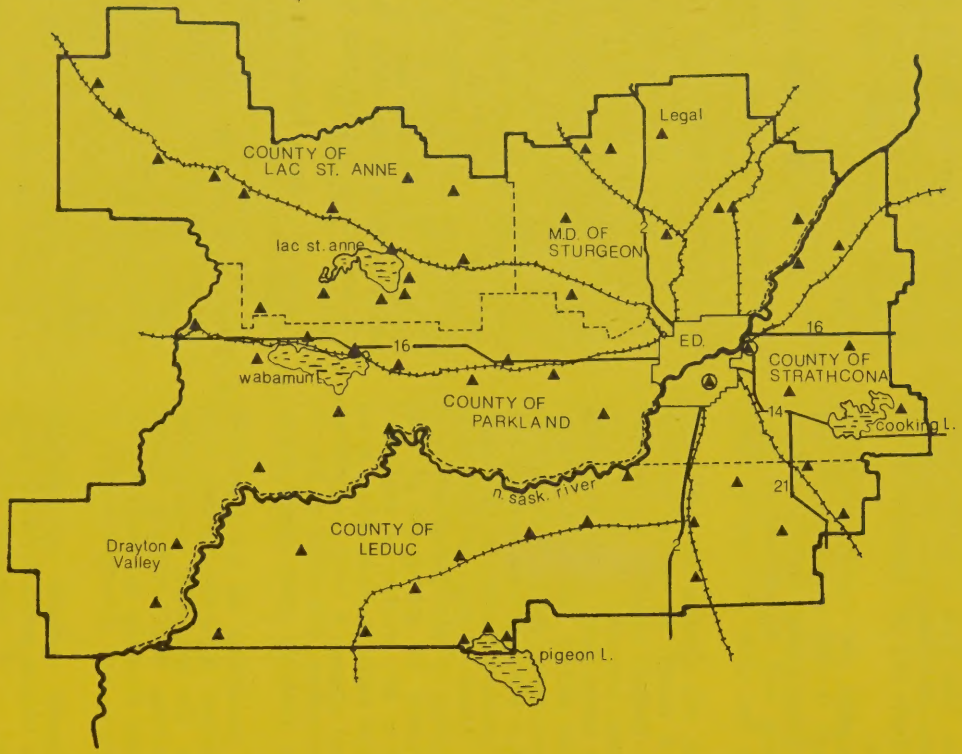
Several alternatives for the disposal of refuse have been experimented with.

One of the first concentrated attempts to reduce the offensiveness of dumping was that of incineration. This method is still used, whether by individuals (eg. farmers), or by groups (eg. municipalities at large). The con-

[1] *Science Council of Canada Report No. IX, P. 45*

MAP ONE

WASTE DISPOSAL SITES LOCATIONS WITHIN THE EDMONTON REG. PLAN. COMMISSION

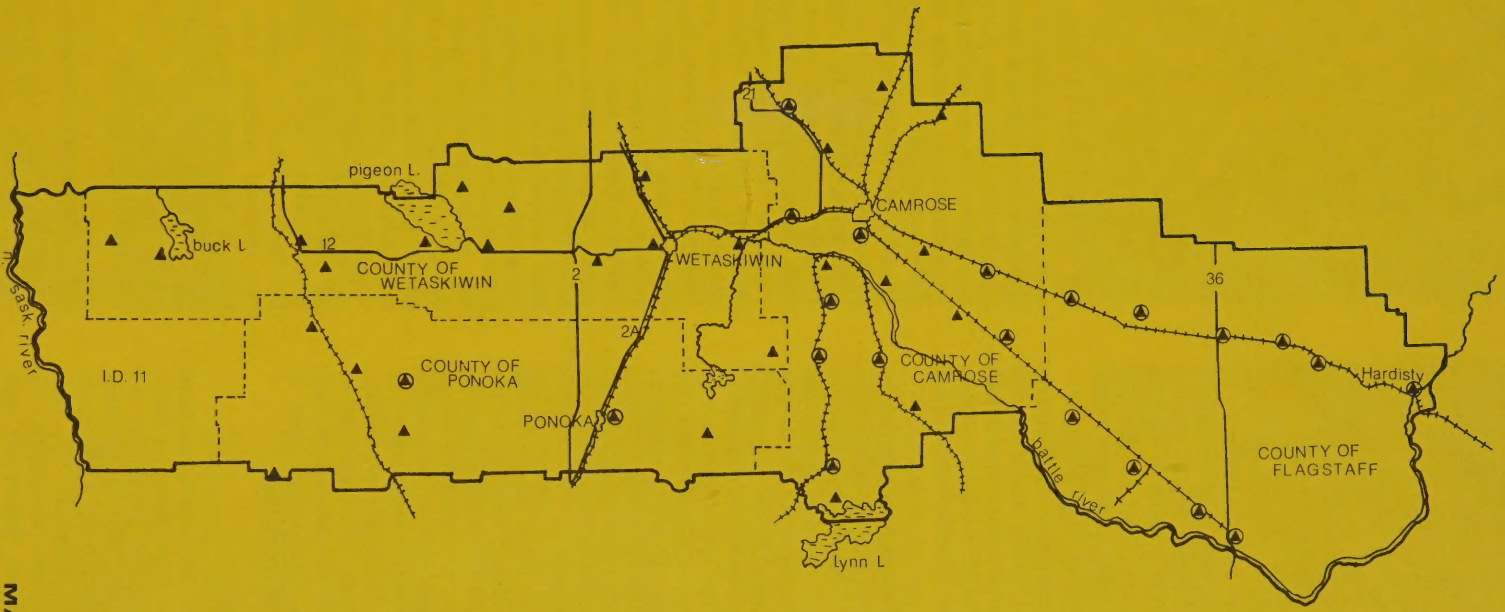


-URBAN MUNICIPALITIES

DISPOSAL SITES

▲ - OTHER DISPOSAL SITES

WASTE DISPOSAL SITES LOCATIONS WITHIN THE BATTLE RIVER REG. PLAN. COMMISSION



▲ - URBAN MUNICIPALITIES DISPOSAL SITES

▲ - RURAL MUNICIPALITIES DISPOSAL SITES

MAP TWO

text in which we discuss incineration will not be that of open burning (eg. a farmer burning rubble), but rather it will be a discussion of burning as done in incinerating plants (that being a building in which refuse is sorted to a certain extent, burned, the escaping smoke controlled for such things as its pollution content, and the residue removed and passed on to another type of disposal process). Such a process, which involves the reduction of solid wastes to gases and ashes, is both costly and wasteful. The costs include various elements: collection, incineration, and sometimes where applicable, the disposal of the residue left after incineration. This process is wasteful in that nothing is retrieved from the garbage residue except some metallic substances which have not completely burned or melted.

Whatever method is employed for the treatment of solid waste, a landfill operation will always be required if only to dispose of valueless inert residue material such as ashes, oxidized metal, molten plastics, etc. (See maps 1 and 2.)

The sanitary landfill operation consists of compacting the refuse as much as possible, then treating it with a cover of dirt six inches thick, intermittently over the period that the landfill process is in operation, to one or two feet thick upon termination of the process in a particular spot. Most landfill or modified landfill systems are carried out in such a way that garbage is seldom left uncovered for any great length of time. Properly operated, the sanitary landfill method produces little detrimental effect on the environment. This process does take up valuable and often expensive land space, however.

One process that has been experimented with as part of the sanitary landfill or incineration method is that of fragmentization. This process involves the shredding of refuse and results in a garbage that is practically odor free as well as being unattractive to rodents and vermin etc. It greatly diminishes the volume of the garbage. This of course, reduces the number of trucks needed to haul the garbage to its final destination; either a sanitary landfill site or an incinerator.

(b) The present situation.

It is also useful, in considering present methods, to look at the legislation involved. Present provincial regulations governing the disposal of solid waste are very comprehensive, and Alberta has often been a leader in the battle for a cleaner environment. This legislation, parts of which are reproduced in Appendix A of this booklet, points out that every waste disposal operation shall be designed and operated in accordance with the latest edition of the Provincial Board of Health Design and Operating Standards. These regulations have not in themselves, however, solved all aspects of the problem. For instance, many smaller municipalities find it almost impossible to comply with the regulations concerning incineration. Their efforts must successfully comply with the Provincial Board of Health Regulations for the control of air pollution and the Clean Air Act. This, along with the fact that the incineration process is fairly costly to install, often results in smaller municipalities by-passing the incineration process in favour of another less costly process — this has meant opting for the sanitary landfill process.

In the City of Edmonton, incineration is gradually being phased out in favour of sanitary landfill. The use of fragmentization and the availability of land for the landfill process have combined to make this available as a viable alternative to solid waste disposal for the City of Edmonton. Other cities, however, may choose incineration as the best form of solid waste disposal for them (taking costs to the environment and costs to the individual into consideration). Although it has disadvantages which have been previously mentioned, proposals are being presented concerning incineration that will perhaps make it the best form of solid waste disposal in the future. For instance, a study done for the City of Edmonton entitled "A Proposal for the Use of Garbage Fuel", proposes that the heat generated from the incineration process be used to heat buildings. Moreover, new technology may eventually allow for the complete disintegration of all substances in the incineration process into a vaporous form. Following this, the vapour could be sent up a fractioning tower in which all the substances would be drawn off at their condensing point and then reutilized or recycled.

Neither outright burning in an open area, nor casual dumping of refuse is permitted, by law, anywhere in the province. Although it has been difficult to decide what effects certain disposal methods have on our environment, it has been obvious that dumping and open burning have very obvious detrimental effects. Moreover, the costs to clean them up vastly out-weighs their convenience, and so they have been outlawed.

(c) Criteria for Choosing a Method.

Of all the questions to be asked about the various methods of solid waste disposal,

the two most important are: What are the environmental consequences of a particular method, and what are the financial costs of such a method? Weighing one against the other often determines which method a particular municipality or district will use. The difficulty with this type of comparison is that the environmental costs of a particular method of solid waste disposal cannot be determined accurately solely in dollars and cents. Moreover, except in general terms, disposal methods cannot be compared among one another even in terms of financial costs, because conditions vary so much among cities and areas — even within Alberta. Landfill site costs, for instance, vary greatly, not only among areas, but in any one area depending upon the land market. Or, variations in the composition of industrial garbage among areas can affect fragmentation or incineration costs. Thus, only roughly can it be indicated whether one method is more expensive than another. In the practise of actually choosing among methods, a municipality would have to undertake a study indicating the specific costs in that area for various alternatives between and within methods. In the following discussion on the pros and cons of each method therefore, no attempt has been made to suggest which method is "best".

(i) Incineration

The gases from incineration pollute the environment to the extent that most people concerned with the environment believe that either the form of incineration must be changed drastically, or that it must be phased out to protect the environment and the individual who must breathe polluted air. The total cost of incineration can be considered in its elements: the collection of the refuse, the incineration and finally the disposal of the residue. Collection costs are in the range of $9.20 per ton to $11.30 per ton. Incineration costs vary from $3.07 per ton in Edmonton to $3.62 per ton in Calgary. Site costs for disposal of the residue add from $1.25 per ton of ashes in Calgary to $1.50 per ton in Edmonton.

(ii) Landfill

There is a basic misunderstanding concerning the environmental acceptability of sanitary landfill as a method of solid waste disposal. Landfill sites can be used without significant pollution problems in dry and cold climates. Locations where there is little rain to penetrate the refuse, deposits and the polluting leachates in their downward movement have a chance to be filtered out in sand or absorbed in clay, and the Edmonton area, where the ground is virtually frozen from November to March, also has few problems with leaching, although there is the possibility that ground water and surface water could be affected by nearby landfill and dump areas. (See diagram one.) The financial costs of sanitary landfill include collection and site disposal expenses. The latter may be slightly higher for sanitary landfill than for incineration as the greater volume of refuse requires more site space. However, the additional costs involved in the incineration method for the actual incineration, usually results in that method being overall more expensive than the solely sanitary landfill method.

(iii) Fragmentization

While fragmentization incurs extra initial cost in that a grinding machine must be obtained, it may save money in the long run, in that fewer trucks are needed to carry the same amount of garbage to its destination and less space is required at the site itself.

Fragmented garbage has less affect on our environment than garbage in its raw form. After being treated in this manner the garbage is much less offensive and requires less sanitary landfill space in the final disposal. In some areas fragmented garbage has even been known to support growth of vegetation with little or no ground cover.

(d) Who decides what method is to be used?

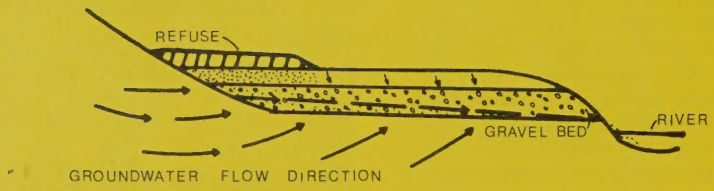
This is the jurisdictional issue. It involves provincial, regional and municipal levels of government and what their role in solid waste disposal should or could be. The immediate questions that arise are:

- — should each municipality throughout the province adhere to a strict, set, unitary code?
- — could a code be established to allow for flexibility in administration of the regulations so that the particular circumstances of an individual community could be considered?
- — as the size of the province is such that regional variations are often very distinct, should a regional approach to developing disposal systems be considered?
- — could not such systems bring together various communities in common or cooperative disposal projects under the Provincial Board of Health Regulations?
- — should responsibility for carrying out regulations be decentralized to regional authorities?

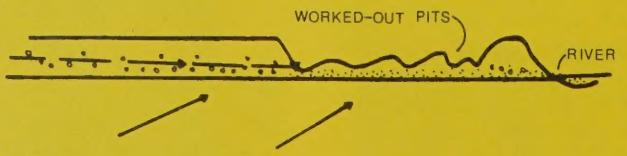
INTERACTIONS BETWEEN THE ELEMENTS AND REFUSE

A. IN A DRIER ENVIRONMENT, THE WATER TABLE IS USUALLY DEEP AND LITTLE LEACHING TAKES PLACE

B. IN A HIGH PERMEABILITY SITUATION, RAPID MOVEMENT OF LEACHATE IS POSSIBLE, CONSTITUTING A HIGH-RISK SITUATION FOR CONTAMINATION



C. BURIED, HIGHLY PERMEABLE GRAVEL-BEDS INTERCEPT THE UPWARD-MOVING GROUNDWATER PREVENTING IT FROM REACHING THE SURFACE AND DRAINING IT TOWARDS THE RIVER, THEREFORE THERE IS CONTAMINATION OF GROUNDWATER



D. AN EDMONTON SITUATION -- SPRINGS SEEPING INTO LANDFILL PITS MAY ULTIMATELY LEAD TO CONTAMINATION OF THE RIVER

DIAGRAM ONE

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Certainly these are relevant questions and might be answered by assessing the impact of present provincial regulations concerning solid waste disposal — regulations which establish a common code for the entire province (the regulations distinguish between urban and rural municipalities, but among different size municipalities only those over 5,000 are distinguished from those under 5,000; the regulations do not take into account differences which might exist among various regions of the province). The regulations are formulated by the Provincial Board of Health under the very general authority delegated to it by Section 7 (1) of the Public Health Act. (Excerpts from these regulations are reproduced in Appendix A.) The Provincial Board of Health is composed of key officers in the provincial Civil Service as outlined in Section 3 of the Public Health Act. Uniform Provincial requirements often cause different municipalities to incur non-uniform costs when attempting to meet these requirements. These varying costs may be due to the variability of climate across the province, geological formations affecting ground water level and movements, availability of acceptable landfill sites and the concentration in numbers of populations, etc. In particular, it is generally the case that smaller municipalities pay more for systems to look after their solid wastes than large municipalities. Such variations have led some people in Alberta to inquire as to the desirability of blanket regulations which affect all parts of Alberta in the same way. Smaller municipalities should perhaps be allowed to use rather less expensive methods of disposal than now prescribed. Perhaps the larger centres should be encouraged, or if necessary required, to adopt more refined methods than those presently required to be employed. Perhaps by replacing blanket regulations with those concerned with a particular region — either formulated by the Provincial Board of Health or by regional authorities — we can, perhaps, better deal with the solid waste problem by taking into account differences among regions and among different sizes of municipalities.

In this way, the financial costs of solid waste disposal could be kept reasonably uniform throughout the province, without standards of environmental quality suffering. Indeed, environmental quality might be improved by having different standards to meet different situations in different geographic areas.

As well, approaching solid waste disposal regionally would avoid serious regional disparities among different sized municipalities.

For instance, Mr. K. Dudman states that an integrated plan for an overall garbage disposal system for the large cities and their surrounding municipalities must be developed for the future to eliminate what will be increasing regional disparities in taxpayer costs and to prevent further environmental damage with improperly operated disposal systems.

Besides the question of uniform regulations, there is a second jurisdictional issue involved here: conflicts of jurisdictions.

Conflicts of jurisdiction occur at each level of government; among departments and agencies which have overlapping, sometimes conflicting responsibilities for certain aspects of the waste problem. In some instances, a particular aspect of the problem may fall into a jurisdictional gap between departments and could be in danger of not being dealt with adequately.

The acquisition of suitable, acceptable landfill sites is often a source of inter-municipal conflict. Many cities do not have enough space within their boundaries to provide landfill sites and therefore must apply to get a site in an adjacent rural municipality. Again, perhaps by delegating authority for solid waste disposal to regional authorities, many of these problems could be resolved.

Thirdly, we must consider who is to pay for this disposal. Possibly, provincial and even federal government financial participation will be necessary to ensure the success of any system that is adopted.

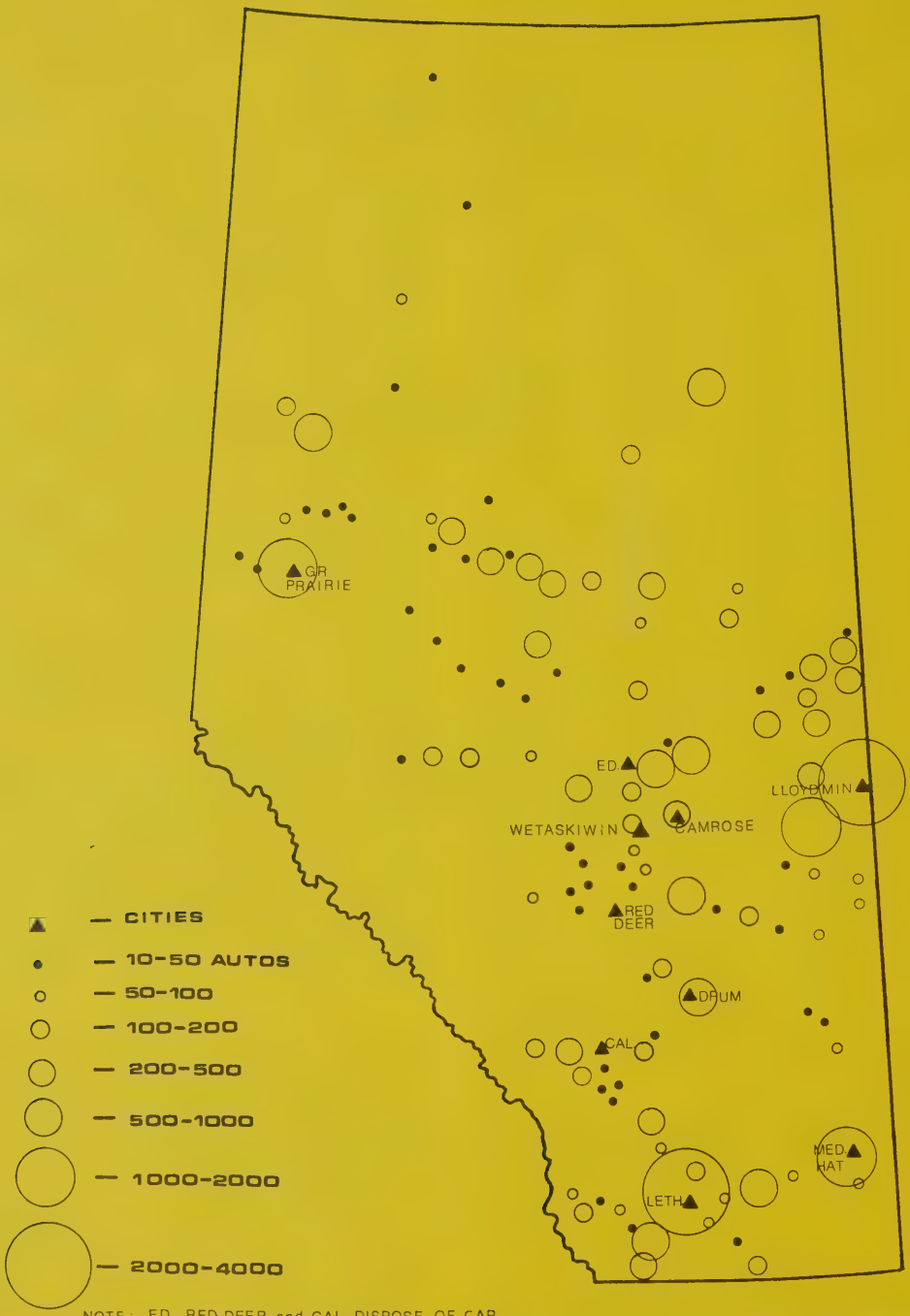
In the past, municipalities have usually been able to cope with general refuse handling and disposal, but with the emergence of new demands on the tax dollar, the rising costs of labor and the standards and goals set up for the protection of the environment (see Appendix A), many municipalities are finding it increasingly difficult to stay ahead of the garbage build-up.

III. RECYCLING

A major alternative to solid waste disposal is recycling. Emphasis on recycling could give rise to a new orientation of technology based on the value of lasting performance. Recycling has both immediate possibilities and long range consequences.

Under each of these two sub-headings, recycling can be divided into two general groups. The first group would comprise all articles or materials which could be reconditioned for restoration to fulfil their original intended function. They would include, among others,

NUMBER OF DERELICT AUTOS IN ALBERTA



NOTE: ED., RED DEER and CAL. DISPOSE OF CAR BODIES AS THEY BECOME DERELICT

MAP THREE

all second-hand goods including hand-me-downs. The second group would include all articles or materials which can be converted to a form different from that originally intended and would include all dismantled items and constituent materials. Most interest is focused on the second group.

(a) The problem is: Where do we start?

— Where does recycling fit into the total scheme of what we are doing presently with our wastes?

— Should we plunge right in and advocate complete recycling as the solution to our solid waste problem, or should recycling continue to be phased into our present system?

— Should it eventually take over as the ultimate solution to solid waste, or should it be merely a partial solution?

Perhaps the best immediate approach to recycling would be to make a fuller use of existing programs. Before complete recycling is advocated as the ultimate solution to solid waste, studies will have to be undertaken to determine its total scope and implications.

Technical studies must be done to determine to what extent recycled materials can or should be used by our society. Types of legislation necessary, or indeed desirable to integrate a recycling format into the present social system must be examined. Also, before citizens and authorities can be convinced that recycling would be the best solution to the problems of solid waste, its advantages, not only in terms of environmental quality, but also in terms of dollars and cents, may have to be demonstrated. When these studies have been undertaken, major headway will have been made towards an economy that could make optimum use of recycling processes.

There already is interest in recycling in our society. It is necessary though, that this interest in recycling become important to a much wider audience with individual citizens, business groups and governments all entering extensively into the investigation of recycling as the answer to problems of solid waste.

(b) Immediate Possibilities

There are several types of recycling already in operation on a small scale.

(i) Derelict Auto Bodies

One project that is being carried out now and is more than breaking even financially is that of recycling old car bodies. Hopefully it will place such reutilization techniques in a better light. Although car bodies constitute only one form of solid waste, their successful recycling may pave the way for other recycled products. In the Province of Alberta this year some 65,000 vehicles will be retired due to obsolescence, extensive wear, or damage beyond economical repair. Many of these will be abandoned outside commercial scrapyards. In addition, there is a much greater number of rusting hulks already in existence and lying throughout the province. These derelict automobiles fall into three categories:

1. Vehicles acquired legally by automobile junk dealers and scrap processers after they become obsolete or unfit for further use.
2. Vehicles acquired legally by backyard car strippers, usually for the purpose of only partial cannibalization, and
3. Vehicles illegally and/or indiscriminately abandoned by their owners or by illicit drivers as the result of criminal activity.

It is sometimes thought by strict enforcement of general nuisance laws or enactment of special car body clean-up campaigns, this problem will disappear. Actually, both solutions have been attempted in Alberta, but as any trip through the province will show, abandoned cars still abound in great numbers. (See Map 3.)

There are several methods of disposing of auto hulks. They include abandonment, burying, baling and shredding. In the past few years, the first method has become unacceptable and the second method is being seriously questioned.

The last two have become the plausible solutions to the rapid build-up of car bodies throughout the province.

Baling consists of compressing a car into a compact, manageable size and is an attempt to reclaim the abandoned auto body for further use. A baled auto can be recycled by a steel mill or can be used in other situations such as retaining walls along water fronts or construction sites. The difficulty with this method is that the grade of material within a bale is of rather low quality and many steel mills which make use of scrap metal in their smelting process are hesitant to accept very much baled scrap. On the other hand, in its use, the baled metal will corrode and the bale may become unstable. It is therefore, not a completely successful product for use in land or water situations where rusting may take place.

To initiate the baling process, many costs must be considered. The hulks must be stripped of as much non-ferrous materials as possible

if it is to be reprocessed — otherwise, the grade of scrap is unacceptable. A car squasher merely flattens cars to facilitate easier transporting. A baler compresses this flattened car to an easily usable size. While a squasher is portable, the baler is much too large to be portable. Therefore the hulks must be transported to the baler. The cost of transportation can be diminished by employing a car squasher to reduce the bulk of the car body.

The fourth method, the shredding process, also has considerable cost involved. In a province the size of Alberta, transportation will always be a major cost factor in any recycling program. In fact, once a decision is made to move anything that is abandoned to a place of reuse, transportation costs will be incurred. As with baling, a collection procedure to gather the hulks together is required. Transportation facilities are necessary to get the car body to the shredding plant; although again, the use of a car squasher would reduce these costs. In terms of reclamation however, the shredding operation does provide some positive alternatives. The car body only needs tires, gas tanks and seats removed in order to be acceptable for an efficient shredding operation. This process, with the assistance of magnetic separators, can segregate most non-ferrous material, including paint and plastics, from the valuable ferrous material. The resultant scrap is of reasonably high quality which is quite acceptable to steel companies. The lack of research into the shredding process prevents a dollar comparison with the baling process.

If the auto bodies are not moved from the sites of their abandonment in the first place, it is obvious that no direct costs are incurred. But what about indirect costs that arise such as health hazards due to the attraction of such sites to vermin, etc., the pollution of the ground water system resulting from rusting metal, etc?

— Is the potential damage to the environment, both urban and rural, of non recycling auto bodies going to be less costly in the long term?

This question, increasingly raised by many concerned people, leads to additional questions:

— Should legislation be developed making it an offence to abandon a car other than at an authorized disposal collection yard?

— Should a limit be placed on the number of abandoned vehicles a commercial scrapyard can store on its property?

— Should a limit be set on the duration a hulk can be stored anywhere?

— Should a disposal tax be charged the new car purchaser to cover its eventual disposal?

— Might this tax be partially recoverable by the person turning the vehicle over to an authorized collection yard for recycling purposes? Should there be incentives to collect derelict cars?

— Might a disposal tax assessed on yearly motor vehicle licences to cover the costs of a continual clean-up program within each municipality to remove all derelict auto bodies to "recycling centres" alleviate this problem?

— Would it be possible to make transfer of ownership a "registered event" required of both purchaser and vendor in order to provide direct tracing of ownership in the event of a vehicle being abandoned?

Until a recycling policy is formulated, we will face the question: What will be done with retired cars? — There already are a lot of them! (See Map 3.)

(ii) Composting

This process involves garbage being treated and used as a fertilizing agent. This process is neither very popular nor very practical in Alberta, due to climatic conditions. And, while quantity of refuse is an important factor in this as well as other forms of recycling, its composition can be of even greater concern. The variety of materials involved in the total complex of waste can cause difficulties for the composting process. The major difficulty for this process then, is the separation out of many non-degradable substances and the large quantity of non-useful substances before very positive results are attainable.

Spreading of the final compost over the land can make that land more productive and consequently, one of our most valuable land resources (the production of land for agricultural use) is preserved or even extended.

(iii) Other Types

At present, there are a number of other types of recycling operations being carried out in Alberta that could become part of a major recycling program. For example, the Edmonton Salvage Company Ltd., is engaged in the collection of a number of materials: waste paper; scrap film; silver-contaminated solutions resulting from the X-ray, photographic and plating industries; and amber, emerald and blue glass.

Waste paper, the Company's emphasis, accounted for approximately 10,000 tons of recycled paper last year; obtained from an area within a thirty mile radius of Edmonton. This company, however, indicates that it is facing problems in terms of collection and in obtaining markets for recycled paper.

In general, there are a number of problems in all these incipient recycling schemes. All problems in this area, however, boil down to financial considerations, given present technology and legislation.

New developments with regard to the former and changes in the latter could however, lead to much more extensive recycling operations in all of the areas discussed above, as well as in a number of others.

For instance, the cost involved in recycling often deters a manufacturer from using recycled materials as opposed to raw materials and, as yet, our resources are not seen to have depleted to the extent that recycled material must be used to assure future generations of having anything.

(c) Long Range Considerations

The problems arising now with products that are being recycled are only part of the long range problems which will arise in the future concerning a recycling system. With waste recycling in its primitive stages, the collector of second hand machinery, the collector of waste paper or of bottles, the collector of restaurant garbage, are all engaged in feasible operations; but not of the sort necessary if waste recycling is to be developed extensively. A type of work that does not now exist may be necessary: services that separate out all potentially recyclable wastes before the remainder is shunted into incinerators or pits, and distribute each kind to a primary specialist who will convert it into reusable products.

Comprehensive waste separators may be municipal employees or of a private business concern, the latter perhaps being paid fees. Jane Jacobs, in "The Economy of Cities", suggests that in this way, recycling could well develop into a full scale industry; even within a particular metropolitan area.

A second possibility for total recycling involves a re-orientation and re-education of the consumer.

Another far reaching approach to recycling has been suggested by Zikmund and Santon who state that marketers could reduce the quantity of trash and facilitate the recycling of used packages requiring manufacturers take such action as:

1. building refuse value into the package (a jelly jar becomes a drinking glass).
2. avoid unnecessary packaging (does an aspirin bottle package have to be placed inside a cardboard box package?).
3. using materials which are degradable or which simplify recycling.
4. placing a message on the package reminding the consumer to dispose of his trash properly.

He could be encouraged to separate his garbage into its reusable components before throwing it out. In the end, the action on his part may result in the stabilization of prices of such products as tin cans, newspapers, etc.

This recycling process could result in a much smaller portion of our environment being used up or ruined every year to meet our affluent demands. But until recycling becomes popular, that is, until we finally realize that the savings incurred of our environment and of our resources are worth the inconvenience that we may have to put up with in recycling products, this process will be left to those few small businesses in this area which are profitable.

With the increasing depletion of a limited supply of non-renewable resources, and with the continual build-up of more and more solid wastes resulting from the throwaway cult generated in our affluent society, sooner or later we will be looking towards total recycling schemes of some kind.

— Is a change in social attitudes necessary for any lasting solution to the solid waste problem?

— Should the manufacturer be made responsible for the solid waste that the production of his product would ultimately generate?

— Would experiments and research and total separation schemes be warranted?

IV. CONCLUSIONS

How we deal with the solid waste problem is a matter of concern to all citizens, rural or urban. Whatever the solution, the cost involved must be borne by someone! There are questions then that remain to be answered:

— To what extent should individuals, industry and government be responsible for solid wastes?

— Should there be more variation in the legislation regulating solid waste to take into account various regional or local factors (i.e. should some areas have the

right to alter their priorities concerning both solid waste itself and its total budget?)

— What would be the benefits of a regional approach to the problem of solid wastes?

— Could "recycling" become an integral part of our solution to the solid waste problem, and thus a part of our total economy?

— Might manufacturers be made more responsible for solid waste at the manufacturing and disposal stages?

— Are disposal taxes to be assessed against those items in our society most likely to be tossed away?

— To what extent are we willing to pay for a cleaner environment?

— For what aspects of the problem is more research required?

Immediate possibilities for improving some aspects of solid waste disposal and expanding recycling operations are available. Close attention might be paid as to how they could be implemented. "Total recycling" is a long range consideration, but it should be considered now so that it can be developed at the quickest possible pace.

EXCERPTS FROM THE PROVINCIAL BOARD OF HEALTH REGULATIONS RESPECTING THE CONTROL OF REFUSE DISPOSAL SYSTEMS

Appendix A

DIVISION 12
REGULATION RESPECTING THE CONTROL OF REFUSE DISPOSAL SYSTEMS

Extracts From The Alberta Gazette of October 15, 1971

PART 1 — GENERAL

Definitions

12-1-1 In these Provincial Board of Health Regulations Respecting the Control of Refuse Disposal Systems:

(a) "dry disposal site" means a type of waste disposal system in which non-offensive waste material may be deposited and ultimately covered by earth or other suitable cover material as hereinafter provided in these regulations,

(b) "modified landfill" means a type of waste disposal system in which waste material is deposited by plan on a specified location, and then on basis less frequent than that required for a sanitary landfill,
  (i) is compacted by force applied by mechanical equipment, and
  (ii) then covered by a layer of earth or other suitable cover material,

(c) "rural municipality" means any county, municipal district, improvement district, or special area,

(d) "sanitary landfill" means a type of waste disposal system in which waste material is deposited by plan on a specified location and then on a daily or three times a week basis dependent on the size of the community as specified elsewhere in these regulations,
  (i) is compacted by force applied by mechanical equipment, and
  (ii) then covered by a layer of earth or other suitable cover material,

(e) "urban municipality" means any city, town, new town or village,

(f) "waste disposal system" means any land upon which, or any building in which, waste material is deposited or processed for incineration, ultimate disposal or decomposition, and shall include:
  (i) any transfer station, and
  (ii) any facilities provided at the site for the storage of waste and cover material, and
  (iii) any facilities for the handling and disposal of waste, and
  (iv) any land or buildings or machinery or other facilities appertaining to the purpose of the waste disposal system.

Permissible Waste Disposal Systems

12-3-1 Except as provided in section 12-61-2 (respecting old automobiles), no person, municipality or corporation shall dispose of waste material in any place other than:

(a) a dry disposal site, modified landfill, sanitary landfill or unclassified waste disposal system established, operated and maintained in accordance with these regulations, or

(b) an incinerator constructed, operated and maintained in accordance with:
  (i) the Provincial Board of Health Regulations for the Control of Air Pollution, and
  (ii) the Clean Air Act and Regulations made pursuant thereto.

12-3-2 Notwithstanding section 12-3-1 a modified landfill shall not be used for disposal of waste material by:

(a) any urban municipality having a population of 5,000 or more, or

(b) any portion of a rural municipality (such as a hamlet) having a population of 5,000 or more, or

(c) any combination of urban municipalities and/or portions of rural municipalities having a total population of 5,000 or more.

12-3-3 Notwithstanding section 12-3-1 a dry disposal site may not be used for disposal of waste material except as provided in section 12-33-1.

Provision of Waste Disposal Systems

12-4-1 Except as provided in sections 12-4-6, 12-4-7, 12-4-10, and 12-4-11 and section 12-61-4 (respecting old automobiles) every urban municipality shall provide, operate and supervise one or more waste disposal systems for the sanitary disposal of all waste or refuse created in such urban municipality.

12-4-2 If required by the Provincial Board of Health, any rural municipality shall provide, operate and supervise one or more waste disposal systems for any hamlet located in the said rural municipality for the sanitary disposal of all waste or refuse created in the said hamlet.

12-4-3 (1) Any rural municipality may provide, operate and supervise a waste disposal system without instruction so to do from the Provincial Board of Health.

(2) Any waste disposal system established by a rural municipality as authorized by subsection (1) shall comply with the requirements of these regulations.

12-4-4 (1) If required by the Provincial Board of Health any corporation shall provide, operate and supervise a waste disposal system for disposal of specified wastes or all wastes created in any plant or factory operated by such corporation or for the disposal of wastes created in any camp or community occupied by employees of such corporation.

(2) Any waste disposal system required by the Provincial Board of Health under authority of subsection (1) shall comply with the requirements of these regulations and the corporation concerned shall have the same responsibility as a municipal government for the proper operation of the waste disposal system.

12-4-5 (1) Any corporation may provide, operate and supervise a waste disposal system for disposal of specified waste materials or all waste materials created in any plant or factory operated by such corporation or for the disposal of waste materials created in any camp or community occupied by employees of such corporation.

(2) Any waste disposal system established by a corporation as authorized by subsection (1) shall comply with the requirements of these regulations and the corporation concerned shall have the same responsibility as a municipal government for the proper operation of the waste disposal system.

12-4-6 Nothing in these regulations shall be construed to prevent any two or more adjacent municipalities entering into an agreement to provide, oper-

ate and supervise a waste disposal system or waste disposal systems for the benefit of all the municipalities entering into the agreement.

12-4-7 (1) Any municipality which is required or authorized by one of the preceding sections 12-4-1, 12-4-2, or 12-4-3 to provide a waste disposal system may enter into a contract with a person or corporation to provide and/or operate a waste disposal system for the disposal of either all or a portion of the waste material created in the municipality.

(2) In any case where a person or corporation provides and/or operates a waste disposal system on behalf of a municipality as authorized by subsection (1), such person or corporation shall have the same responsibility as the municipal government would have under these regulations for the proper provision and/or operation of the waste disposal system.

(3) In any case where a municipality contracts with a person or corporation to provide a refuse disposal system as authorized by subsection (1), the municipal government shall be responsible for ensuring that the contracting person or corporation carries out the provisions of these regulations which may be applicable.

12-4-8 (1) Any corporation which is required or authorized by section 12-4-4 or section 12-4-5 to provide a waste disposal system may enter into contract with a municipality, person or second corporation to provide and/or operate such waste disposal system.

(2) In any case where a contract is entered into under subsection (1) the municipality, person or second corporation shall have the same responsibility as the original corporation would have under these regulations for the proper provision and/or operation of the waste disposal system.

12-4-9 Except as provided in sections 12-4-10 and 12-4-11 and section 12-61-4 (respecting old automobiles), every municipality and every corporation which is required by these regulations to provide a waste disposal system must accept all waste material created within the municipality or created by the corporation at its waste disposal system.

12-4-10 Notwithstanding section 12-4-9 a municipality shall not be required to accept agricultural waste.

12-4-11 Notwithstanding section 12-4-9 a municipality shall not be required to accept at its waste disposal system waste material from any factory or other business premises:

(a) which exceeds in volume before compaction one cubic yard per day, or
(b) which exceeds in weight one ton per day, or
(c) which by itself or in combination with other material likely to be present in the waste disposal system:
  (i) may create a danger to the health or safety of persons employed at or visiting the waste disposal system, or
  (ii) may be a public hazard.

Land Tenure

12-5-1 (1) Before any waste disposal system is opened for use the person, municipality or corporation which will be operating the waste disposal system shall obtain:

(a) title to the site and to any right-of-way ancilliary thereto in the name of such person, municipality or corporation, or
(b) a lease in a form and for a period of time satisfactory to the Provincial Board of Health permitting the use of the site and any necessary access thereto.

(2) In the case of a dry disposal site or a transfer station the lease shall be satisfactory to the Local Board of Health in place of the Provincial Board of Health as otherwise required by clause (b) of subsection (1).

PART 2 — SANITARY LANDFILLS

Sanitary Landfills — Permits

12-11-7 The Provincial Board of Health upon receiving an application for a permit to establish, construct or operate a sanitary landfill may, before issuing the permit, require:

(a) such changes as the Board deems necessary in the public interest in accordance with the intent of these regulations, and
(b) a statement of consent or agreement from the municipality in which the sanitary landfill is, or is to be located, and
(c) that the applicant "advertise" the application in any or all of the following ways and report the response to the advertising to the Board:
  (i) publishing a notice of the application in a newspaper having general circulation in the locality where the sanitary landfill is, or is to be located once a week for three successive weeks,
  (ii) by notifying by registered mail owners of adjoining property, and of residences within 1,500 feet of the site of the proposed sanitary landfill,
  (iii) by holding of a duly publicized public meeting in a location convenient to the area affected for the purpose of explaining the proposal.

12-11-8 (1) Clause (c) of section 12-11-7 shall not apply to any application for a permit to establish a sanitary landfill made on behalf of the City of Calgary or the City of Edmonton.

(2) In the cases referred to in subsection (1) the requirements of the City's Zoning or Development By-Law in respect to advertising shall apply.

12-11-11 (1) Any person, municipality or corporation proposing to establish or construct a sanitary landfill may submit to the Provincial Board of Health a preliminary outline of the proposal for the purpose of determining:

(a) the necessity and extent of the advertising required under section 12-11-7, or
(b) the general suitability of the site before purchasing or leasing the same or before preparing extensive plans for the operation of the sanitary landfill.

(2) The preliminary outline of the proposal referred to in subsection (1) need not be prepared by a professional engineer.

Sanitary Landfills — Locations

12-12-1 No sanitary landfill shall be established, constructed or operated so that there is any disposal of waste material within 300 feet of any cemetery which is being or has been used for human burials at the time the modified landfill is established or constructed.

12-12-2 Except as provided in sections 12-12-3, 12-12-4 and 12-12-5 hereinafter no sanitary landfill shall be established, constructed or operated within 1,500 feet of any hospital, restaurant or other place where food for humans is prepared or stored, or of any dwelling being used for human habitation at the time the sanitary landfill is established or constructed.

12-12-3 Section 12-12-2 shall not apply in the case of a dwelling which is owned by the person, municipality or corporation which owns or operates the sanitary landfill and which is occupied by the owner or an employee of the said owner.

12-12-4 The Provincial Board of Health may relax the requirements of section 12-12-2:

(a) where a sanitary landfill will be operated for a defined number of years and will result in an improvement to the area used for sanitary landfill purposes; or

(b) where in the opinion of the said Board, satisfactory buffer arrangements will be provided.

12-12-5 Where the conditions of section 12-12-4 will not apply the Provincial Board of Health may still relax the requirements of section 12-12-2 where in the opinion of the said Board satisfactory safeguards are or will be provided for the protection of the rights of persons who would otherwise be protected by section 12-12-2.

Sanitary Landfills — Design and Operation

12-13-1 Every sanitary landfill shall be designed and operated in accordance with the latest edition of the Provincial Board of Health Design and Operating Standards for Sanitary Landfills.

12-13-2 (1) Where a sanitary landfill serves a population of less than 20,000 cover shall be applied at least three times per week.

(2) Where a sanitary landfill serves a population greater than 20,000 cover shall be applied on a daily basis.

(3) The requirements of subsections (1) and (2) may be relaxed during winter operations in accordance with the provisions of the Provincial Board of Health Design and Operating Standards for Sanitary Landfills.

PART 3 — MODIFIED LANDFILLS

Modified Landfills — Permits

12-21-6 The information required for consideration of application for permit for a modified landfill shall include a sketch plan showing:

(a) the location and boundaries of the proposed site in relation to the boundaries of a quarter section, and

(b) the general slope of the ground in the vicinity, and

(c) the location of all sources of water supply for domestic purposes within 1,500 feet of the proposed waste disposal ground, and

(d) the location of any rivers, lakes, streams or other natural bodies of water within 1,500 feet of the proposed site, and

(e) the location of any irrigation ditch or other irrigation works within 1,500 feet of the proposed site.

12-21-7 The information required for consideration of application for permit shall include a plan of the site which, together with supporting data, will indicate the method to be followed in operating the modified landfill.

12-21-8 The information required for consideration of application for permit shall include proposed details for the control of salvage activities.

12-21-10 The Provincial Board of Health upon receiving an application for a permit to establish, construct or operate a modified landfill may, before issuing such permit, require:

(a) such changes as the Board deems necessary in the public interest in accordance with the intent of these regulations, and

(b) a statement of consent or agreement from the municipality in which the modified landfill is, or is to be located, and

(c) that the applicant "advertise" the application in any or all of the following ways and report the response to the advertising to the Board:

(i) publishing a notice of the application in a newspaper having general circulation in the locality where the modified landfill is, or is to be located, once a week for three successive weeks,

(ii) notifying by registered mail, owners of adjoining property and of residences within 1,500 feet of the site, of the proposed modified landfill,

(iii) holding of a duly publicized public meeting in a location convenient to the area affected for the purpose of explaining the proposal.

Modified Landfills — Locations

12-22-1 No modified landfill shall be established, constructed or operated so that there is any disposal of waste material within 300 feet of any cemetery which is being or has been used for human burials at the time the modified landfill is established or constructed.

12-22-2 Hereinafter a modified landfill shall not be established or constructed or operated within 1,500 feet of any hospital, restaurant or other place where food for humans is prepared or stored, or of any dwelling being used for human habitation at the time the modified landfill is established or constructed.

12-22-3 Section 12-22-2 shall not apply in the case of a dwelling which is owned by the person, municipality or corporation which owns or operates the modified landfill and which is occupied by the owner or an employee of the said owner.

12-22-4 Except as provided in other sections, a modified landfill shall not be established, constructed or operated within 300 feet of any developed road allowance, highway, street or other travelled road.

Modified Landfills — Design and Operation

12-23-3 It shall be the responsibility of the person, municipality or corporation operating a modified landfill to ensure that every matter or thing deposited in such modified landfill shall be covered with a layer of earth or other material to deodorize the material deposited and to prevent the breeding of flies and the harboring of rats and to prevent any other nuisance.

12-23-4 There shall be no burning of waste material in any modified landfill.

12-23-5 Except as provided in section 12-23-6 every modified landfill shall be provided with suitable trenches or pits to receive all waste material.

12-23-6 (1) In lieu of trenches or pits the Provincial Board of Health may approve other arrangements for the operation of a modified landfill which will fulfil the intent to facilitate compaction and covering of waste material.

(2) An arrangement approved by the Provincial Board of Health under subsection (1) shall be considered to be a trench or pit for the purposes of compaction and cover as required in section 12-23-7.

(3) In no case shall a modified landfill be operated in a manner which will be based on the unconfined depositing of waste material on the ground surface.

12-23-7 (1) The waste material in the trench or pit shall be covered with soil or other suitable material at such intervals and in such quantities as shall be necessary to fulfil the requirements of section 12-23-3 but except during winter the interval shall not exceed three months.

(2) The waste material should be compacted before the cover required by subsection (1) is applied.

(3) Any waste material which was not deposited in the trench or pit shall be pushed into the trench or pit at such times as the cover required by subsection (1) is to be applied.

(4) When a trench or pit is filled, a final cover of at least two feet of suitable soil shall be applied and the area seeded to grass.

(5) An adequate number of trenches or pits shall be prepared before winter to receive all waste material which may be created during the winter.

PART 4 — DRY DISPOSAL SITES

Dry Disposal Sites — General Requirements

12-33-1 (1) Materials accepted for disposal at a dry disposal site shall be limited to those which are non-toxic and non-putrescible in nature.

(2) Without limiting the provisions of sub-section (1), a dry disposal site generally may be used for the disposal of ashes, demolition refuse, non-combustible residue from incinerators and similar waste material.

(3) Without limiting the provisions of sub-section (1) a dry disposal site shall not be used for the disposal of kitchen garbage, manure, oil, chemical waste or other offensive material.

12-33-2 The person, municipality or corporation operating the dry disposal site shall make positive provision to limit the use of the dry disposal site in accordance with section 12-33-1.

12-33-3 There shall be no burning of material in any dry disposal site.

12-33-4 When a dry disposal site is to be closed the person, municipality or corporation responsible shall ensure that all waste material in the site is fully covered with an adequate layer of suitable soil and that the area is completed to conform with surrounding properties.

Dry Disposal Sites — Locations

12-32-1 No dry disposal site shall be established, constructed or operated within 300 feet of any cemetery which is being or has been used for human burials at the time the dry disposal site is established or constructed.

PART 5 — UNCLASSIFIED WASTE DISPOSAL SYSTEMS

Unclassified Waste Disposal Systems — Permits

12-41-1 No person, municipality or corporation shall establish, construct or operate any unclassified waste disposal system unless a permit so to do has been obtained from the Provincial Board of Health.

12-41-2 (1) Every application for a permit to establish, construct or operate an unclassified waste disposal system shall be accompanied by:

(a) full details of all processes to be used for the disposal or conversion of waste materials, and

(b) drawings of the layout of any buildings to be used for processing and storing, and

(c) details of any materials to be salvaged from the waste material and proposals for disposal of the same, and

(d) details of any products to be obtained through processing the waste and proposals for disposal of the same, and

(e) details of the disposal methods to be used for any residue.

(2) The information and drawings required by subsection (1) shall be prepared by a professional engineer registered to practise in Alberta and shall bear his seal.

12-41-3 The Provincial Board of Health, upon receiving an application for a permit to establish, construct or operate an unclassified waste disposal system, may, before issuing the permit, require:

(a) such changes as the Board deems necessary in the public interest in accordance with the intent of these regulations, and

(b) a statement of consent or agreement from the municipality in which the unclassified waste disposal system is to be located, and

(c) that the applicant "advertise" the application in any or all of the following ways and report the response to the advertising to the Board:

(i) publishing a notice of the application in a newspaper having general circulation in the locality where the unclassified waste disposal system is to be located once a week for three successive weeks,

(ii) notifying by registered mail owners of adjoining property and of residences within 1,500 feet of the site of the proposed unclassified waste disposal system.

(iii) holding of a duly publicized public meeting in a location convenient to the area affected for the purpose of explaining the proposal.

12-41-4 (1) Clause (c) of section 12-41-3 shall not apply to any application for a permit to establish an unclassified waste disposal system made on behalf of the City of Calgary or the City of Edmonton.

(2) In the cases referred to in subsection (1) the requirements of the City's Zoning or Development By-Law in respect to advertising shall apply.

Unclassified Waste Disposal Systems — Locations

12-42-1 An unclassified waste disposal system shall not be established, constructed or operated within 300 feet of any cemetery which is being or has been used for human burials at the time the unclassified waste disposal system is established or constructed.

12-42-2 An unclassified waste disposal system shall not be established, constructed or operated within 1,500 feet of any hospital, restaurant or other place where food for humans is prepared or stored, or of any dwelling being used for human habitation at the time the unclassified waste disposal system is established or constructed.

12-42-3 Section 12-42-2 shall not apply in the case of a dwelling which is owned by the person, municipality or corporation which owns or operates the unclassified waste disposal system and which is occupied by the owner or an employee of the said owner.

PART 7
DISPOSAL OF OLD AUTOMOBILES AND OTHER SPECIAL WASTE MATERIALS

Disposal of Old Automobiles

12-61-1 Notwithstanding anything contained in any other other section of these regulations, old automobiles and other large metallic objects may be disposed of in the manner prescribed in sections 12-61-2 and 12-61-3 hereinafter.

12-61-2 (1) Old automobiles and other large metallic objects need not be placed in the trenches or pits provided in the sanitary landfill or modified landfill.

(2) Old automobiles and other large metallic objects may be placed in a portion of a sanitary landfill site or modified landfill site reserved for the purpose or in a separate location established for the purpose.

(3) Old automobiles and other large metallic objects when received in the areas referred to in subsection (2) may be compacted or flattened:

(a) to facilitate ultimate disposal by burying, or

(b) for salvage operations.

(4) Notwithstanding subsections (2) and (3) the disposal of old automobiles shall be conducted so as not to create an unsightly condition.

12-61-3 Where old automobiles and other large metallic objects are prepared for salvage by burning out unwanted material, such burning shall be carried out in conformity with:

(a) the Provincial Board of Health Regulations for the Control of Air Pollution, and

(b) the Clean Air Act and Regulations made pursuant thereto.

12-61-4 (1) Notwithstanding anything contained in any other section of these regulations, a municipality shall not be required to accept for disposal an old automobile or automobile hulk from any person or corporation engaged in the wrecking or dismantling of automobiles to salvage parts for sale.

(2) Except where a municipality does accept old automobiles or automobile hulks from persons engaged in dismantling or wrecking automobiles to salvage parts for sale, any person or corporation carrying on such business shall make provision for disposal in accordance with sections 12-61-2 and 12-61-3.

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